CPM COST ANALYSIS

NGV LIFECYCLE

TOPICS

- Simple ROI
- Fuel Cost Control
- Defining the Scope of Your Analysis
- What if …

CPM and Lifecycle Cost

OLD HABITS … DIE HARD

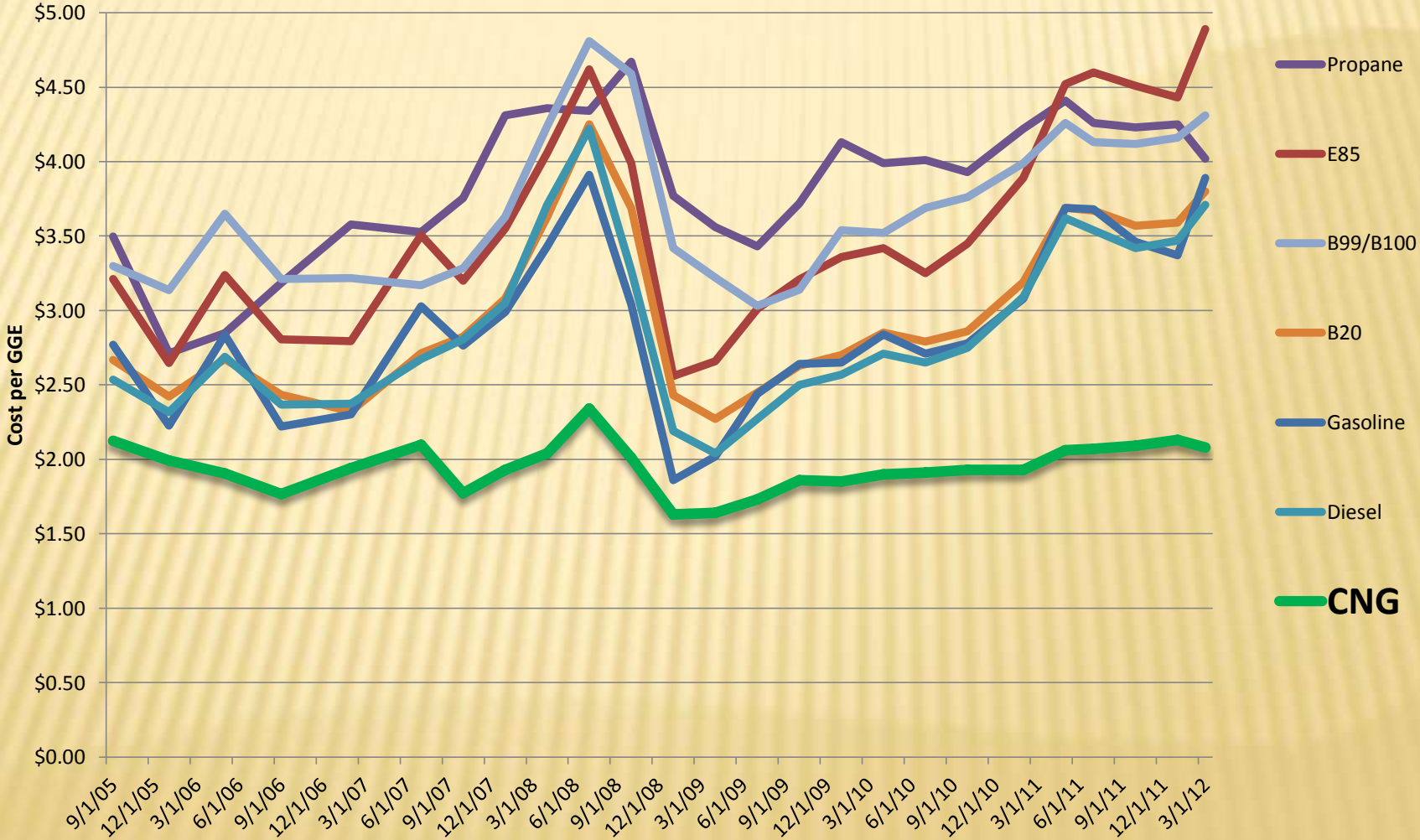
- Purchase Cost / Perceived Value
- Resale Value / Relative to Market Conditions
- Spec for Fuel Economy
- Expected Maintenance Costs
- Component Cost/Benefit Analysis

Biases created from experience can be misleading.

FUEL BASED MODEL

- Old Model
  - Improve MPG – Improve CPM.
  - Diesel fuel is a variable that can be radical in nature.
- New Model
  - Change Fuel Type to Improve CPM
  - CNG has shown a high level of stability.

U.S. AVERAGE RETAIL FUEL PRICES – 2005/ 2012



MPG / FUEL COST / CPM

Diesel Price		$ 3.899
Diesel MPG	Diesel CPM	Incremental CPM Benefit
5.75	0.678	
6.00	0.650	.028
6.25	0.624	.026
6.50	0.600	.024
6.75	0.578	.022
7.00	0.557	.021
7.25	0.538	.019
7.50	0.520	.018
7.75	0.503	.017
8.00	0.487	.016

On average a .25 MPG improvement will net a 2.1¢ CPM reduction.

MPG / FUEL COST / CPM

Diesel Price	$ 3.899	Expected MPG Drop	10%
CNG Price	$1.799		

Diesel MPG	Diesel CPM	Breakeven Efficiency	Expected Efficiency	Expected CPM	Expected CPM Reduction
5.75	0.678	2.65	5.18	0.348	0.330
6.00	0.650	2.77	5.40	0.333	0.317
6.25	0.624	2.88	5.63	0.320	0.304
6.50	0.600	3.00	5.85	0.308	0.292
6.75	0.578	3.11	6.08	0.296	0.281
7.00	0.557	3.23	6.30	0.286	0.271
7.25	0.538	3.35	6.53	0.276	0.262
7.50	0.520	3.46	6.75	0.267	0.253
7.75	0.503	3.58	6.98	0.258	0.245
8.00	0.487	3.69	7.20	0.250	0.238

VEHICLE PROFILE (NGV & EPA10 DIESEL)

- Unit Lifecycle – 4 years / 600,000 Miles
- Additional Vehicle Cost - $40,000
- Diesel Application MPG – 6.50
- Efficiency Reduction – 10%
  - Spark Ignited 12:1 vs. Diesel 16:1
- Cost of Diesel – $4.00 per gallon
- Cost of CNG – $2.00 per Dge

All CPM and Lifecycle Cost will be based on this profile.

VEHICLE COST

- The fuel system on a natural gas vehicle will increase the vehicle cost by $25,000 - 60,000 depending upon fuel type and quantity.

Diesel Tractor	Cost Per Mile	NGV Tractor	Cost Per Mile
$ 105,000	$ 0.175	$ 145,000	$0.242
		Effect to CPM	$0.067

FUEL COST COMPARISON

- Diesel Cost / MPG– 4.00 /6.50
- Natural Gas Cost / MPDge– 2.00 / 5.85

Diesel CPM	N/Gas CPM
$ 0.615	$ 0.342
Effect to CPM	$ 0.273

SIMPLE VEHICLE & FUEL COST EVALUATION

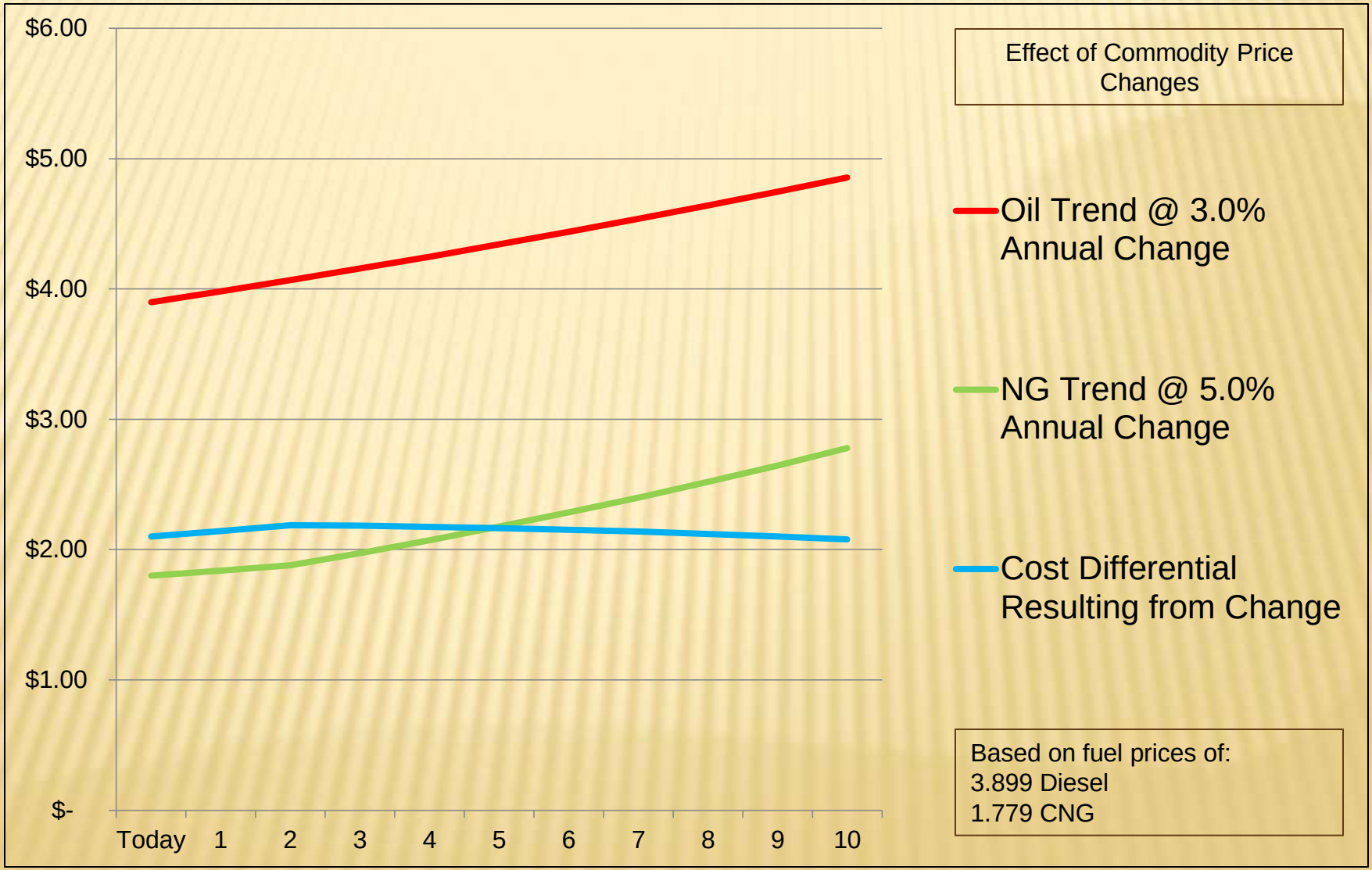
Vehicle Type	Purchase CPM	Fuel CPM	Combined CPM	600K Life Cost
Diesel	0.175	0.615	0.790	474,000
Natural Gas	0.242	0.342	0.584	350,400
			0.206	123,600

Annual Mileage	40,000 Fuel Saving	Recovery Time of Upcharge	Lifecycle ROI
150,000	194,175	1.295 Years	2.075 or 207.5%

The ROI is being driven by a monthly fuel savings of $3,412.50

This example leaves you with a return of $83,600 after recovery of the $40,000 vehicle upcharge.

WHAT IF … NATURAL GAS GOES UP IN PRICE



MAINTENANCE

DIESEL

- DEF
- After-treatment Maintenance
- Component Cost
- Reliability

NATURAL GAS

- PM Frequency
- Spark Plugs
- Longevity

RESALE CONSIDERATION

Best Case

- Natural Gas Vehicle Market Continues to Grow.
- Recover like return on chassis and market on fuel system. 40% Truck and 50% Fuel System.
- 60,000 ???

Worse Case

- Move Fuel System to new trucks and part or scrap chassis.

WHAT IF … RESALE IS POOR

- $40 – 45,000 Diesel Tractor
- The $40,000 Fuel System has a 20 year life.

Move Fuel System to New Vehicle	
Value of Fuel System	$ 40,000.00
Labor to Move Fuel System from Retired Vehicle to New	($ 1,200.00)
Salvage Value of Truck	$ 7,500.00
Processed Residual	**$46,300.00**

PROJECTED LIFECYCLE COMPARISON

	Diesel CPM	NGV CPM
Vehicle Cost	0.175	0.242
Fuel	0.615	0.342
Resale or Recovery	(0.075)	(0.075)
Subtotal	0.715	0.509
Maintenance	0.033	0.033
Projected Lifecycle Cost Comparison	0.748	0.542

Your Fleet Vehicle Information	
Expected Annual Utilization (Mileage)	150,000
Operational Days Per Week	7
Current MPG	6.50
Current Diesel Tank Spec	100
Current/ Expected Diesel Cost/ Gallon	$ 4.000
Current Vehicle Utilization Life Cycle	600,000
Operational Life in Years	4.00
Current Vehicle Cost	$ 105,000.00
Finance Rate	3.00%
Finance Term Years	4

Your Maintenance Information	Mileage	Cost Per
Oil Change Interval	15,000	$ 250.00
Tune Up Interval	150,000	$ 150.00
Injector Replacement	300,000	$ 2,500.00
DPF Filter Cleaning	250,000	$ 400.00
DPF Replacement	500,000	$ 3,250.00
DEF Consumption/ 100 Gal. of Diesel	4.00	$ 2.69
In Frame Major	1,000,000	$ -

NGV Equipment Spec. Information		
Engine Specified (ISL-G, ISX-G or GX)	ISL-G	
Duty Type: Std Duty=1; Sevr Duty=2; Bus=3	1	
Fuel Type (CNG or LNG)	CNG	
If LNG, How Many Liquid Gallons	238	
LNG - Gallons/ Dge Conversion	128	
CNG Fuel Capacity Spec (in DGE)	90	
Expected MPDge (5.525 = 85% of MPG)	5.85	90% Efficiency
Additional Cost of Vehicle	$ 40,000.00	

Vehicle Resale Estimates	
Estimated Resale Value of Your Current Vehicle	$ 45,000.00
Estimated Resale Value of the Natural Gas Vehicle	$ 45,000.00

Comparative Lifecyle Recap	Conventional Fuel Life Cost	Conventional Fuel CPM	Natural Gas Fuel Life Cost	Natural Gas Fuel CPM
Vehicle Cost and Finance	$ 111,557.01	$ 0.186	$ 154,054.92	$ 0.257
Fuel Cost	$ 369,230.77	$ 0.615	$ 209,422.05	$ 0.349
Maintenance (Base Service, Fuel & After-Treatment)	$ 19,793.08	$ 0.033	$ 32,066.67	$ 0.053
Resale Return on Investment	$ (45,000.00)	$ (0.075)	$ (45,000.00)	$ (0.075)
Cost of Ownership	$ 455,580.85	$ 0.759	$ 350,543.63	$ 0.584

Ownership Advantage with Natural Gas Power	$ 105,037.22	$ 0.175

Compressed Natural Gas vs. Diesel ROI Modeling

Your Fleet Information	
Expected Annual Utilization	150,000
Operational Days Per Week	7
Current MPG	6.50
Current Diesel Tank Spec	100
Current/ Expected Diesel Cost/ Gallon	$ 4.00
Current Vehicle Utilization Life Cycle	600,000
Operational Life in Years	4.00
Current Vehicle Cost	$ 105,000.00
Finance Rate	3.00%
Finance Term Years	4

NGV Equipment Spec. Information		
Engine Specified	ISL-G	
Truck Make		
Fuel Capacity Spec (in DGE)	90	
Expected CNG Cost Per DGE	$ 2.00	
Expected MPDge (5.525 = 85% of MPG)	5.85	90%
Additional Cost of Vehicle	$ 40,000.00	

ROI
1.12 Years

Your Maintenance Information	Mileage	Cost Per	NG Powered Veh. Interval	NG Powered Veh. Cost Per
Oil Change Interval	22,000	$ 300.00	9,000	$ 200.00
Tune Up Interval	130,000	$ 150.00	75,000	150
Injector/Spark Plug Replacement	500,000	$ 3,500.00	60,000	$ 500.00
DPF Filter Cleaning	275,000	$ 400.00	N/A	N/A
DPF Replacement	400,000	$ 2,650.00	N/A	N/A
DEF Consumption/ 100 Gal. of Diesel	4	$ 2.69	N/A	N/A
In Frame Major	-		400,000	$ 15,000.00

	Current	CNG
Mileage Range	605	474
Fuel Cost Per Mile	$ 0.615	$ 0.342

Vehicle Weight w/Fuel	15,200	14,200
Average CWT Rate Per Mile	$ 0.03	
Average Length of Haul	75	
Loaded Miles Percentage	60%	
Expected Resale Value	$ 45,000	$ 45,000

Modeling Results - Comparisons

The results below include: ***VEHICLE COST AND FINANCE; FUEL EXPENSE; ENGINE*** and ***AFTER-TREATMENT MAINTENANCE*** and ***PROJECTED VEHICLE RESALE VALUES***. The results do not include vehicle system other than those listed above.

	Procurement	Fuel Cost	Eng. Maint	Gain on Sale	Basic Op Cost	Lost/Gain Frt	My Current Vehicle
Current Equipment	$ 111,557.01	$ 369,230.77	$ 27,854.16	$ 45,000	**$ 553,641.94**	$ (108,000.00)	**$ 661,641.94**
CPM	$ 0.186	$ 0.615	$ 0.046	$ 0.075	**$ 0.923**	$ (0.180)	**$ 1.103**
							NGV Vehicle
CNG Powered Unit	$ 154,054.92	$ 205,128.21	$ 40,833.33	$ 45,000	**$ 445,016.45**	$ -	**$ 445,016.45**
CPM	$ 0.257	$ 0.342	$ 0.068	$ 0.075	**$ 0.742**	$ -	**$ 0.742**
Difference (Current - CNG Unit)	$ (42,497.91)	$ 164,102.56	$ (12,979.17)	$ -	**$ 108,625.48**	$ 108,000.00	**$ 216,625.48**
CPM	$ (0.07)	$ 0.27	$ (0.02)	$ -	**$ 0.18**	$ (0.18)	**$ 0.36**

DEFINE YOUR OPERATIONAL NEEDS

Proper Tank Sizing

- What is your vehicle range requirement?
  - Is the NGV going to have the same fuel efficiency as your current vehicle? If not, what is the projected difference.

Define Your Fueling Plan

- What is your fueling plan?
  - Beginning of Day, End of Day, In Route or a Combination.

Maintenance

- PM's and Inspections
- Support
- Shop Conditioning

Co-worker Training

- Drivers & Technicians if Applicable

THANK YOU!

Kwik Trip Alternative Fuels

1-855-710-3800

KTBeyondGreen@kwiktrip.com